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I, JONNE YABSLEY, TEAM LEADER EXAMINATION SUPPORT AND SALES hereby certify that annexed is a true copy of the Provisional specification in connection with Application No. 2002951396 for a patent by NINARAN CO. PTY. LTD. as filed on 16 September 2002.

WITNESS my hand this
Thirtieth day of September 2003

J R Yabsley

JONNE YABSLEY
TEAM LEADER EXAMINATION
SUPPORT AND SALES

AUSTRALIA

PATENTS ACT 1990

PROVISIONAL SPECIFICATION

for the invention entitled:

" Horseshoe "

The invention is described in the following statement:

HORSESHOE

Background and Summary of the Invention

This invention concerns the incorporation of shock absorbing characteristics into the structure of a horseshoe. It has particular applicability for racehorses which, although bred for speed and endurance, often suffer from leg problems due to the very high stresses placed on the legs due to high impact loads while racing and especially during the heavy training required in preparation for racing.

Attempts have been made previously to incorporate layers of elastic, shock absorbing materials, such as silicone rubber, into horseshoes but none have been successful in the marketplace. This has been at least in part due to one or more of:

- poor lifespan due to a high wear rate of the shock absorbing material,
- failure of the bond between the main structural material and the shock absorbing material,
- in order to provide sufficient shock absorption, the rubber needed to be so thick that the weight of the shoe became too heavy.

An aim of the present invention is to provide a horseshoe which at least reduces these difficulties.

Accordingly, in one aspect the invention provides a horseshoe comprising a layer of rigid material sandwiched between a first layer of shock absorbing elastomeric material and a second layer of shock absorbing elastomeric material, at least one of said first and second layers being bonded to the rigid material at a face where the rigid material has a plurality of indentations or a plurality of raised humps.

Preferably one of said first and second layers is bonded to the rigid material at a face where the rigid material has a plurality of dished depressions and the other of said first and second layers is bonded to the rigid material at a face where the rigid material has a plurality of raised humps.

Preferably the indentations are dished depressions. Preferably the dished depressions are circular. Preferably the humps are circular. The elastomeric material in the first layer may be a different thickness and/or have a different composition to the elastomeric material in the second layer.

An insert may be anchored into said layer of rigid material and protrude into one of said first and second layers to provide a wear resistant strip.

Brief Description of the Drawings

In order that the invention may be more fully understood there will now be described, by way of example only, preferred embodiments and other elements of the invention with reference to the accompanying drawings where:

Figure 1 is a plan view of a horseshoe according to a first embodiment of the invention,

Figure 2 is a cross sectional side view of the horseshoe shown in Figure 1,

Figure 3 is a cross sectional front view of the horseshoe shown in Figure 1, and

Figure 4 is a plan view of only some components of the horseshoe shown in Figure 1.

Figures 2 and 3 have been drawn such that the plane of the cross section wanders across the shoe to show relevant features in a manner which is self explanatory to a person skilled in the art.

Description of Examples of the Invention and the Preferred Embodiment

Referring to the Figures, a horseshoe 10 has a generally conventional overall horseshoe shape. From a toe 16 the shoe extends by way of two side arms 11 and 12 to a pair of heels 18. The shoe 10 has an outer edge 13, an inner edge 14, a raised toe clip 20 and nail holes 22.

As best seen in Figures 1, 2 and 3, the shoe 10 has a composite structure with three layers. The middle layer provides a frame 30 for attachment of the other two layers. The frame 30 is made of an aluminium alloy as commonly used for horseshoes. It provides most of the strength and shape retention for the shoe. The frame is manufactured by pressing a preform from a 4mm thick aluminium sheet, with the toe clip 20 extending out from the toe, then bending the toe clip up into position, and finally heat treating the frame to harden it.

The upper layer 40 is a polyurethane mat approximately 2mm thick which is tightly bonded to the top face 32 of the frame and provides a shock absorbing bed for a horse's hoof. The lower layer 50 is a polyurethane mat approximately 4mm thick which is tightly bonded to the bottom face 34 of the shoe and provides a high friction, wear resistant sole. It should be noted that Figure 4 has been drawn with the upper layer 40 removed. Layers 40 and 50 may be preformed before being adhered to the frame 30, but it is preferred for the layers 40 and 50 to be injection moulded directly onto the frame 30.

The shock absorbing elastomeric materials used in layers 40 and 50 may be any suitable materials but are preferably selected from the range of polyurethanes widely supplied and known by the skilled person. They are preferably a thermoplastic urethane suitable for injection moulding applications and sold under the name Teton 90 by Urethane Compounds Pty Ltd in Australia. Use of a Chemloc (trade mark) primer from Lord Chemicals is also preferred in order to increase the bond between the polyurethane and the metal frame.

The upper surface 31 of the frame incorporates an array of indentations 32. These take the form of relatively gently dished depressions or concavities aligned in an arc across the toe 16 and down the side arms 11 and 12. Each indentation 32 is centred on the centreline of the surface 31. The indentations 32 are circular with a diameter about half the width of surface 31. Their diameter may be between 25% and 75% of the width of surface 31. The depth of the depressions is 2mm, which is approximately a quarter of their diameter, but this could be varied to between 10% and 70%, preferably between 20% and 50%. Although the indentations 32 could be steeply walled, a shallow wall angle is preferred.

It should be noted that in Figure 1, the circles shown corresponding to the indentations 32 do not indicate any feature actually visible in such a view of the upper face of the fully manufactured horseshoe 10. Those circles instead indicate the location of the indentations beneath the overlying upper layer 40.

The lower surface 33 of the frame incorporates an array of protrusions 34. These take the form of relatively gently raised mounds or humps aligned in an arc across the toe 16 and down the side arms 11 and 12. Each protrusion is centred on the centreline of the surface 33. The protrusions 34 are circular with a diameter about half the width of surface 33. Their diameter may be between 25% and 75% of the width of surface 33. The height of the protrusions is 2mm, which is approximately a quarter of their diameter, but this could be varied to between 10% and 70%, preferably between 20% and 50%. Although the protrusions 34 could be steeply walled, a shallow wall angle is preferred.

The indentations 32 and protrusions 34 are formed by press-forming the metal of the frame such that each protrusion is formed directly through the metal from the action of forming a corresponding indentation. The indentations are depressed and the protrusions raised by approximately 50% of the thickness of the metal.

The indentations and protrusions provide the potential for improved adhesion between the shock absorbing materials and the frame material. However it is thought

that the indentations and protrusions provide a more important advantage in that their presence appears in some way to significantly increase the shock absorption characteristics of the layers 40 and 50 when compared to layers of the same thickness when applied to flat surfaces. A full explanation for this improved performance is not known at this time and we do not wish to be limited by some theory which may or may not correctly explain the advantages observed.

In the toe 16 of the shoe, just behind the toe clip 20, a wear strip is incorporated. The wear strip is formed by a steel insert 36 held in a slot 37 which passes through the frame 30. The insert 36 extends to the outer surface of the sole layer 50 and provides resistance to premature wear of the sole layer 50 at the toe 16 while still allowing most of the horseshoe's contact with the ground to be made by the shock absorbing material in the sole layer 50. Both the insert 36 and the slot 37 are curved when viewed from above as in Figure 4, although the insert may be manufactured flat and curved to suit the slot only when it is being inserted into the slot. As can be seen in Figure 2, the thickness of both the insert 36 and slot 37 have a gentle taper, narrowing from the bottom to the top. This facilitates entry of the insert into the slot and also prevents the insert pressing further up through the slot when it is impacted from below during use. The insert 36 may be welded, glued or otherwise affixed into the slot 37, or it may be retained only by frictional wedging within the slot 37 and/or adherence to the sole layer 50.

The inner edge 14 of the frame 30 carries a series of cutouts 38 which provide a region of weakness for plastic deformation of the frame to allow a farrier to bend the shoe to fit it to the particular shape of a given horse's hoof.

As seen in Figure 4, a stepped recess 42 is let into the upper surface 44 of the upper layer 40. The step 42 is approximately 1mm deep and extends approximately 25% of the total width across the face 44. The step 42 allows greater air flow to the horse's hoof while the shoe is fitted and allows greater freedom of movement of the adjacent soft portions of the hoof.

Whilst the above description includes the preferred embodiments of the invention, it is to be understood that many variations, alterations, modifications and/or additions may be introduced into the constructions and arrangements of parts previously described without departing from the essential features or the spirit or ambit of the invention.

For example, while the frame 30 of the preferred embodiment is aluminium, it may instead be formed from any suitable rigid material such as for example steel, magnesium, titanium or a fibre reinforced composite plastics material. While punching and press forming operations are used to form the frame 30 in the preferred embodiment, alternatives could be used such as die casting or injection moulding.

Also, whereas the indentations 32 and protrusions 34 of the preferred embodiment are circular and gently dished or humped with a depth and height respectively about a quarter of their diameter, the invention also envisages the indentations and protrusions being of alternative shapes. Also, instead of a toe clip 20, a horseshoe of the invention may utilise quarter clips, which rise from the outer edge 13 of the side arms 11 and 12, to restrict sliding of the hoof on the shoe.

In a particularly preferred embodiment of the invention, the layers 40 and 50 are applied to the frame 30 at the same time in an injection moulding operation and the polyurethane applied is also caused to cover the outer edge 13, inner edge 14 and the toe clip 20. A particular advantage from providing the polyurethane covering on the outer edge 13 is that if a horse strikes its hoof against another leg, either its own or another horse's in a race, there is significantly less damage done to the leg receiving the blow.

In another embodiment of the invention, a shoe with its edges covered as described in the preceding paragraph has incorporated into the polyurethane a luminescent ingredient so that after exposure to light, the shoe will continue to glow for some time. By means of such shoes, the exact motion of a horse's hooves can be recorded by first causing the shoes to glow and then recording images of the horse in subdued

light in order to highlight the particular motion of the hooves. Such recorded images may then be more readily interfaced with computer-based moving image analysis techniques in order to diagnose possible problems with the horse's gait.

It will be also understood that where the word "comprise", and variations such as "comprises" and "comprising", are used in this specification, unless the context requires otherwise such use is intended to imply the inclusion of a stated feature or features but is not to be taken as excluding the presence of other feature or features.

The reference to any prior art in this specification is not, and should not be taken as, an acknowledgment or any form of suggestion that such prior art forms part of the common general knowledge in Australia.

Dated this 16th day of September 2002

Ninaran Co. Pty Ltd

by their patent attorneys Morcom Pernat

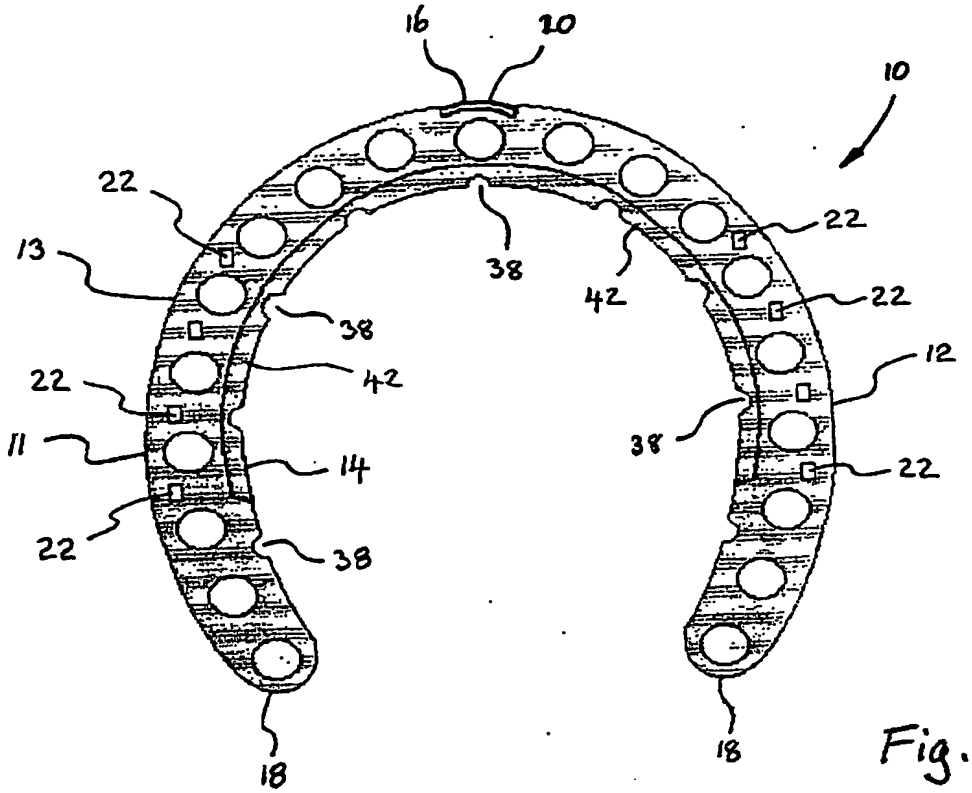

Fig. 1

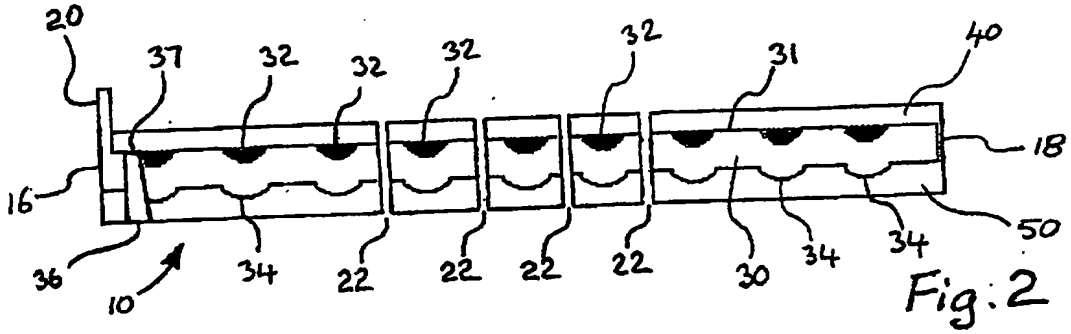

Fig. 2

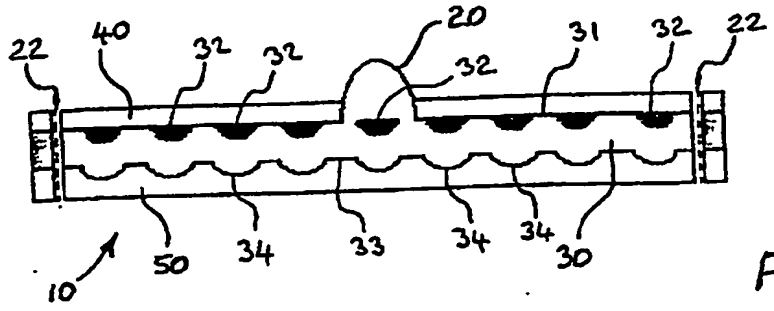

Fig. 3

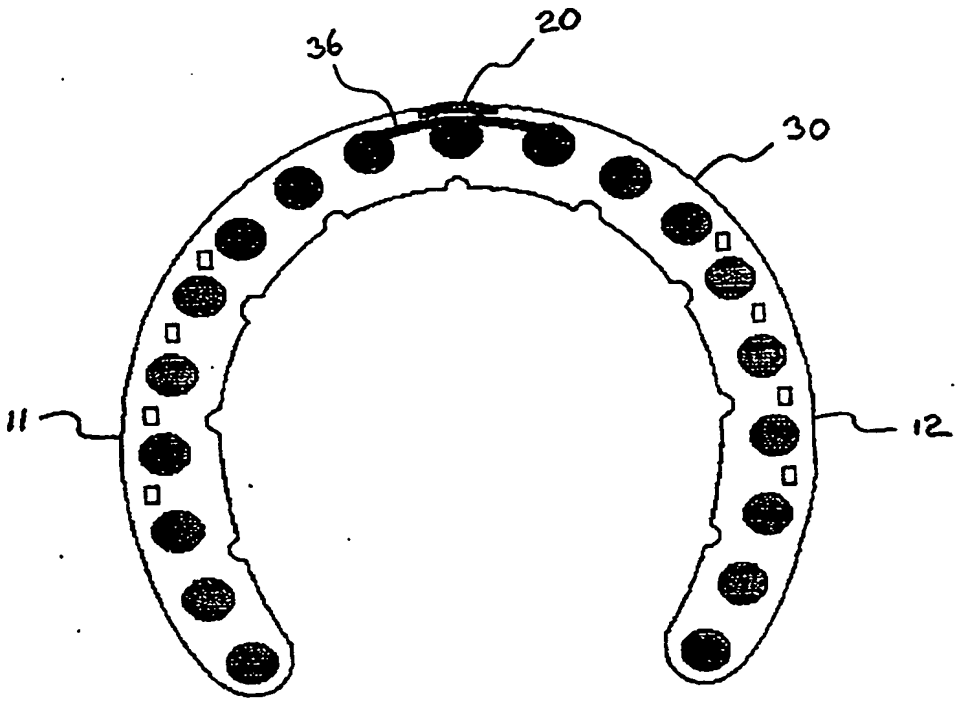

Fig. 4